exact requirements of the British and French markets that the present investigation was undertaken by Mr. Rawlley with the financial assistance of the Carnegie Research Trust and the India Office.

In his inquiry the author visited nearly all the principal silk centres in this country and in France, and the chief value of the investigation lies in the fact that it has secured expression of authoritative views of the leading members of the trade. The wide ground covered by the inquiry can be only briefly summarised here. It will be sufficient to say that we have now a consensus of expert opinion that with adequate improvement in quality and reeling (embracing evenness in size, cleanliness, and uniformity of strength), together with improved trade organisation (mainly with a view to regular supplies), there is an assured market in this country, and in France, for Indian raw silks. The comparative success of the improved Kashmir silk, especially in the French market, is already a demonstration of this fact. As regards waste silk, and also wild Eri silk, the position is the same; given better quality, greater cleanliness, and improved trade organisation, there will be no difficulty in finding a European market for these products. The author's inquiry has performed a double function, inasmuch as it indicates the possibilities of a neglected source of supplies to the consumer of raw silk and an undeveloped outlet for the producer.

A GREAT INDUSTRIALIST.

George Westinghouse: His Life and Achievements. By Francis E. Leupp. Pp. xi+304. (London: John Murray, 1919.) Price 15*s*. net.

THE author, in his preface, regrets the lack of all those written records on which biographers usually rely for providing interesting personal reminiscences. Despite this, however, he has succeeded in compiling an interesting, straightforward narrative which will be inspiring to youth for the example it sets forth of success achieved by indomitable courage and persistent effort, and of fame won on sheer merit, without aid from influence or wealth.

Older readers will find the book of interest in so far as it provides an easily assimilated history of many of the important industrial developments of the past generation. On the other hand, they are likely to be disappointed by the feeling that the part accorded by the author to George Westinghouse in bringing about these developments falls short by no small distance of the part he actually played.

Mr. Leupp frankly admits that he confines himself to a portrayal of the human side of his subject. He dwells particularly on a certain bigness which he finds characteristic of George Westinghouse, who was large-minded and large-hearted, and had the grand style as an inventor, worker, optimist, and industrialist. "Nothing was ever big enough for him." Splendid as was the human side, and worthy as it is of this record, we share with the author the hope that one day some well-known technologist will compile the record of the great inventions and achievements of the man.

It is notable that Westinghouse did not excel at school and college, and that during his brief college career he admitted that he might have been more successful if he could have spared his time for study that he spent more pleasurably in investigating machinery and in making mechanical models. His ready grasp of the opportunity that led to his early connection with railroad work, and ultimately to his development of the air brake, with which his name will always be associated; his investigations into natural gas and its industrial application; his fair appreciation of the inventions of others and readiness to put them into commercial use; his fight for alternating electric current; his care for the welfare of his workpeople; his buoyancy, carrying him over financial crises of a most disturbing character; the esteem of his workpeople that held them to him through precarious times—these tell the man of unusual industrial capacity, personality, and courage.

The book does not possess any marked literary value, but all who are not debarred by its high price will find it worthy of perusal.

FARMING IN THE NEW ERA.

(1) *A Large State Farm: A Business and Educational Undertaking.* By Lt.-Col. A. G. Weigall and Castell Wrey. Pp. xiii+82. (London: John Murray, 1919.) Price 2*s*. 6*d*. net.

(2) *The Farmer and the New Day.* By K. L. Butterfield. Pp. xi+311. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1919.) Price 8*s*. 6*d*. net.

(3) *The Sugar-beet in America.* By Prof. T. S. Harris. (Rural Science Series.) Pp. xviii+342+xxxii. plates. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1919.) Price 2.25 dollars.

(4) *Strawberry-growing.* By Prof. S. W. Fletcher. (Rural Science Series.) Pp. xxii+325+xxiv plates. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1917.) Price 1.75 dollars.

(1) A GREAT deal is being spoken and written about the new era into which we are entering, and agriculturists are wondering what will become of their subject, and incidentally of

themselves. The problem is not peculiar to any one country: it is world-wide.

The British problem was discussed some time ago by Sir A. D. Hall in his book, "Agriculture after the War," and not long since by an anonymous writer in a recent number of the *Edinburgh Review.* One aspect of it is discussed by Lt.-Col. Weigall and Mr. Castell Wrey in the first volume on the list. These authors set out the advantages of the large 10,000-acre farm as a business proposition. The farm of 3000 acres, hitherto considered large, they regard as simply inconvenient; it is too small to be a really big farm, but too large to be a satisfactory small one. They suggest that the State should run one large farm as a demonstration and educational institute, and they consider that others would soon follow, with the result that the method would take its proper place in British agriculture. Many of the difficulties of farming disappear when the scale is made sufficiently large, and the authors make out a good case for the 10,000-acre farm. We doubt, however, whether they will induce any Government Department to embark in the business, Government trading being somewhat under a cloud for the moment; but a company might feel disposed to take the matter up.

(2) The American problem is discussed in the second of the volumes before us by Dr. Butterfield, the well-known president of the Massachusetts Agricultural College, who sets out his views with characteristic frankness, saying exactly what he thinks with the engaging candour that has made him so potent a factor in American agricultural life. One great difficulty Dr. Butterfield finds is that farmers are not, and rarely have been, prominent in the councils of the nation; consequently others have had to devise policies for them. The farmers of ancient Rome and the yeomen of medieval England were in a stronger position, and in Germany, Denmark, and Ireland farmers are a power in the land; in the main, however, they have had but little influence. Some serious consequences follow. The great majority of American farmers are said to receive insufficient return for their labours, the average labour income being only 400 dollars per annum. The middleman, on the other hand, obtains too many of the consumers' dollars; the system of distribution is in general against the farmer's interests. Still worse, there is no agricultural policy. Dr. Butterfield writes sternly about this deficiency in the United States, and notes with surprise the same lack of policy in this country and in the Labour Party's memorandum on reconstruction, of which otherwise he approves. He insists on the need for a strong agriculture, which, however, can eventuate only if the farmer conforms to the spirit of the new age. This calls for a better chance for the ordinary man, the intelligent planning of human progress, a reconciliation between organised effectiveness in human life that also leaves individuals and classes truly free, and an insistence on service to fellow men as the great motive in life.

We need not follow Dr. Butterfield in the elaboration of his thesis; he discusses the various agencies in American country life in their relationship to these four aspects of the new age. The position is similar to that dealt with by Sir Horace Plunkett in Ireland, whose famous slogan, "Better farming, better business, better living," has made a vivid appeal in the States also. More fortunate than Sir Horace, however, Dr. Butterfield has no religious problem, and is able to discuss the Churches as candidly as he does the schools. The author makes certain criticisms of the rural education system of the United States—the most remarkable scheme of educational activities on behalf of the farmer to be found in the world. Englishmen visiting the States have marvelled at its completeness; Dr. Butterfield's criticisms, after all, show that it is human; while sound in essentials, it is apt to go wrong in details.

(3) The two other books on the list furnish good examples of the educational work done by the agricultural experts of the States. Prof. Harris, the director of the Utah Experimental Station, describes the growth of sugar-beet in the States, and brings together a good deal of material previously scattered through many books, journals, and bulletins. The industry has developed there in a remarkable manner. In the 'sixties the production of beet-sugar was less than 300 tons per annum; now it is 800,000 tons. This astonishing development has not been at the expense of cane-sugar, for during the same period raw cane-sugar has risen from 200,000 tons per annum to 2½ million tons. The story of the beet-sugar industry in Europe is well known, and is one of the most interesting cases on record of a fostered key industry growing and flourishing. The history of the crop in America is not so well known, and the author devotes an interesting section to it, also reproducing photographs of some of the early pioneers. The first factory, established in Massachusetts in 1838, failed after two years. The second was established in Utah in 1842, and had the advantage of a considerable natural protection, imported sugar having to be hauled all the way from the Missouri River, and, therefore, costing no less than 40 cents to 1 dollar a pound in Salt Lake

City. But the promoters could not crystallise the sugar; they could only make syrup, and before long they gave up the business. The industry was not definitely established until 1890; development was fostered by means of tariffs, and was very rapid during the war. In the early days of the nineteenth century the percentage of sugar in the root was about 5; now it is about 16–18 per cent. It differs in the different varieties, and is affected by the soil and weather conditions. Sufficient irrigation in dry seasons increases the amount of sugar.

The great difficulty in dealing with the crop is the amount of labour involved in lifting. This is now obviated to a considerable extent by the use of suitable implements, two types of which are described.

The crop is liable to attacks by insect pests and fungi; no fewer than 150 species of insects feed on the beet, of which about forty are of economic importance; the number of fungus pests is small at present, but it is increasing.

(4) The last book on the list, on strawberry-growing, is by Prof. Fletcher, of the Pennsylvania State College. The author opens with the statement, which will be new to many people, that "the strawberry is distinctly North American. Most modern varieties sprang from species only found in the Americas. Progress in the domestication of the fruit was coincident with the introduction into Europe of American types." In 1910 the acreage under strawberries in the United States and Canada was 150,000 acres, said to be more than the combined acreage of all other countries.

Bearing in mind the results of fertiliser experiments at the Woburn fruit farm, the English reader turns with interest to discover what results have been obtained in America. Curiously few fertiliser experiments with strawberries seem to have been made. At the Missouri Station phosphates were beneficial, but nitrogenous and potassic manures were harmful. At the Tennessee Experimental Station no fertilisers proved effective. At Cornell phosphates and potassic fertilisers were beneficial, while nitrogenous manures were harmful. But the experiments lasted only a year or two, and hence the results do not yield as much information as they might as to the needs of the plant. In nature the strawberry flourishes on an acid soil, and in cultivation lime is not found necessary.

As usual in the Rural Science Series, the author brings into the book information on all aspects of the crop, dealing with such diverse subjects as the shape of boxes for packing, the raising of new varieties, insect and fungus pests, etc. It is obvious that no one man can be competent to deal adequately with all branches of the subject, but the general treatment is good and gives the practical man all the help he needs; there are also references to experimental station bulletins, where further information by experts on particular subjects can be obtained.

Some years ago productivity figures were worked out for the farm workers of the different countries of the civilised world. America easily headed the list, which was as follows:—

America	292
Great Britain	126
Germany	119
France	90
Italy	45

Looking through this Rural Science Series, edited by Dr. L. H. Bailey, and seeing how earnestly the authors strive to deal with the conditions actually obtaining in the States, we find at least a partial explanation of the striking superiority of the American worker. Such books could scarcely be written in this country as yet, but there are hopeful signs for the future. A body of young men and young women is gathering at the agricultural experimental stations and colleges of this country capable of doing good work that will bear comparison with anything done elsewhere, and there are increasing signs that their work is favourably and respectfully received by the agricultural community.

E. J. Russell.

OUR BOOKSHELF.

The Building of an Autotrophic Flagellate: Botanical Memoirs. No. 1. By A. H. Church. Pp. 27. (London, etc.: Humphrey Milford and Oxford University Press, 1919.) Price 2*s*.

"The story of the evolution of the plant regarded as expressed in simplest terms as an autotrophic flagellate of the plankton-phase from nothing at all but ionized sea-water" is the subject of Mr. Church's extremely condensed and technical paper. In reality it is rather the requirements of the problem than its solution which Mr. Church indicates, and, whilst he realises the magnificence of the factors with which he has to deal (the sea, for example, is "a medium complex beyond the possibilities of human computation"), he presents the results of much learning in huge unbroken and almost unintelligible paragraphs. Who, for example, would imagine that the following sentence refers to the origin of seaweeds from free-floating algæ? "In the case of initial benthic organism, the first inception of such a continuous deposit [he is talking of cell-walls] prepares the way for the general formula adopted in describing the events in the life of an algal